

he Globemaster III, or C-17, aircraft is capable of rapid global mobility, providing the strategic delivery of troops and various types of cargo to both main and forward operating bases. The C-17 also performs tactical airlift and airdrop missions, including the transportation of patients for aero-medical evacuations.

The C-17 provides outstanding reliability and maintainability, both of which are necessary to meet its demanding operational requirements. Those requirements include a mission success rate of 92 percent and a comparatively low ratio of 20 aircraft maintenance man-hours per flying hour. The flexibility and performance of the C-17 make it the backbone of the United States' global airlift capability, but how does the Air Force meet the high operational standards and comparatively low maintenance requirements of such an advanced piece of military hardware? Organic infrastructure sustainment, of course!

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Organic Infrastructure in DoD

Many hear the word organic and immediately picture themselves standing on the produce aisle of their favorite local supermarket looking at a vibrant selection of tomatoes and corn. In the context we are using it, however, the word organic carries a very different implication—but not necessarily a different definition. Organic logistics infrastructure refers to U.S. government entities (principally DoD organizations) such as inventory control points, maintenance depots, distribution warehouses, and transportation facilities. Like the garden variety organic farmer who uses only natural or self-produced products, organic infrastructure sustainment uses the government's ability to support a product's mechanical and structural demands, such as those seen by the C-17, over the course of its life.

The C-17 is currently maintained under a strategy of flexible sustainment in which a prime contractor (Boeing) is responsible for all system support. The strategy combines interim contractor support, contractor logistics support, and organic repair capabilities to apply the benefits of an open production line while preserving organic infrastructure. Eventually, government capabilities will oversee all repair and maintenance functions. This flexible sustainment contract provides worldwide, round-the-clock support of C-17s in the Air Force. Although C-17s and the Air Force are used as the primary example in this article, the lessons learned can apply to all military services.

Benefits of Flexible Sustainment

One of the greatest benefits derived from a flexible sustainment support strategy is often demonstrated during emergency operations, such as those exhibited when a C-17 aircraft crash-landed at Bagram Air Field in Afghanistan on Jan. 30, 2006. During the incident, the plane's nose gear collapsed and the right main landing gear was damaged. The bottom barrel of the airplane (from just behind the nose to the main landing gear) and a landing gear pod had to be replaced—and this was the first time either had to be replaced in the history of sustaining the Air Force's fleet of C-17s.

Within 24 hours, a team of more than 120 government crash recovery, emergency management, maintenance specialists, and aircraft engineers were dispatched to perform the temporary repairs needed to put the aircraft in a condition that would allow a flight crew to perform a ferry flight to receive permanent repairs. The Boeing technicians came from the company's Recovery and Modification Services team, trained to assist with rescuing damaged aircraft, while the Air Force personnel were battle damage repair specialists from Charleston, S.C., and the Warner Robins Air Logistics Center at Warner Robins, Ga.

Boeing returned a good-as-new C-17 Globemaster III cargo plane to the U.S. Air Force on Nov. 17, 2007—15 months after it was severely damaged in action. It took more than

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86,500 hours and 5,000 parts to repair the aircraft. The crash could have resulted in a \$200 million loss, but instead, there was only a total repair cost of \$25 million—a fraction of what it could have cost the Air Force to replace the entire aircraft. The original acquisition philosophy for the C-17 was to be supported by a contractor for the duration of the weapon system's existence, requiring the product support integrator—in this case, Boeing—to serve as the sole source of repair for all C-17 commodities. In the near future, the government's sustainment role will expand to include depot repair of C-17 commodities. Initially, the government will become the secondary source for depot repair of C-17 commodities. Eventually, all C-17 commodities will be repaired by one of the three air logistics centers, which is similar to the current concept the Air Force uses on other weapons systems.

Developing Depot Repair Capabilities

The C-17 system support manager's office at Warner Robins Air Logistics Center leads in the development of new C-17 depot repair capabilities as part of the Depot Maintenance Activation Working Group. The DMAWG focuses on creating new C-17 depot repair proficiencies at the three Air Force air logistics centers located at Robins, Tinker, and Hill Air Force bases. The goal of the group is to establish effective, affordable, and innovative long-term organic depot capabilities for all C-17 operations.

Critical to the C-17 depot activation process is the Gatekeeper Program, which is an executive steering group that reviews progress and modifies the activation program accordingly. The group is chaired by representatives of the The gatekeepers help
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Air Force Systems Program Office, Air Mobility Command, the U.S. Department of Defense, and Boeing's president for integrated systems.

The group's mission is to provide executive oversight related to key strategic issues impacting the C-17 depot sustainment activities and product support. The gatekeepers help determine the best integrated life cycle management strategy according to statutory and regulatory guidance. In addition, they provide strategic direction to establish effective, affordable, and innovative strategies focused on C-17 sustainment.

Maintenance activation planning teams exist at each of the three Air Force air logistics centers. These teams represent the working level of the C-17 DMAWG that is closest to executing requirements, and they enable the depots to "bend metal" [a slang expression that denotes the actual work being performed]. The teams also coordinate, facilitate, and track C-17 depot activation requirements and plans at the air logistics centers and report the status to the DMAWG. The teams are also directly responsible for opening the technology repair centers, each of which is categorized by a particular C-17 system or type of commodity with a letter designation. Those repair centers, upon being activated, are the actual shops that repair aircraft commodities to serviceable condition.

Federal Guidance

There are two public laws that impact the depot activation community. They are commonly known as "core" and "50/50." These requirements establish the limits to which the government may contract depot repair to commercial sources. Title 10 U.S. Code, Section 2464, Core Logistics Capability, requires that DoD "maintain a core logistics capability that is Government-owned and Government-operated ... to ensure a ready and controlled source of technical competence and resources necessary to ensure effective and timely response to mobilization, national defense contingency situations, and other emergency requirements."

Core capability is composed of all the equipment, facilities, personnel, data, and skill sets necessary to sustain a weapons system vital to national security. Each DoD component is responsible for identifying and reporting core capabilities to the Office of the Secretary of Defense.

Title 10 U.S. Code, Section 2466, Limitations on the Performance of Depot-Level Maintenance of Materiel, mandates that "no more than 50 percent of the funds available in a fiscal year for depot-level maintenance and repair workload may be used to contract for depot maintenance." The percentage was originally 60/40 until Congress increased the spending threshold in 1998. Compliance with 50/50 has been a challenge for the Air Force because of the increase in contract depot maintenance and the retirement of several organically maintained major weapons systems, such as the F-117. In fact, the Air Force required waivers to Title 10, Section 2466 compliance in fiscal years 2000 and 2001 because contract depot maintenance exceeded the 50 percent ceiling. The Air Force is exploring various options to ensure adequate budgeting in the future. C-17 depot maintenance by the government has increased to approximately \$68 million over the last two years. This increase represents depot maintenance dollars used by contractors.

C-17 Challenges

Aircraft depot maintenance activation is already a daunting task when the government is the lead integrator for the effort. Because DoD favors modifying old weapons systems instead of procuring new ones, its acquisition workforce frequently has to develop an entirely new support line for the Air Force. Also, because it is not cost effective to maintain a permanent workforce and skill set dedicated to depot activation, new teams must be created on an as-needed basis. The application of a unique sustainment strategy in addition to existing challenges creates unique issues: data disconnects; consistency with the repairs made by the original equipment manufacturer; and lost damage or destruction that the government does not ordinarily face. Those issues, in effect, make the C-17 a test case for depot activation efforts that involve a contractor in a role for total system support responsibility.

One of the biggest issues the C-17 DMAWG faces is limited data rights. In the 1980s, C-17 program officials, faced with significant schedule delays and budget overruns, decided not to purchase data rights because of the substantial additional cost. That was perhaps a necessary and effective decision at the time. Today, however, the lack of data rights consistently prevents the government from developing maintenance procedures and performing its own repairs on select C-17 components. Acquiring unique repair data may now require paying a premium for unlimited rights or using a turnkey activation process to progressively attain such rights project by project.

Another challenge facing C-17 depot activation is the unique role government air logistics centers play as subcontractors to Boeing. Under its flexible sustainment strategy, Boeing uses a best-value approach for routing repairable items to its suppliers. As a Boeing supplier, each air logistics center competes with commercial industry, forcing it to streamline organic repair processes and business practices in order to offer competitive rates. If a government repair estimate is priced too high, it could be declared beyond economical repair, in which case Boeing would redirect the repairable item to a more cost-effective commercial source of repair. The air logistics centers must effectively earn their share of C-17 commodities workload with capability that meets or exceeds the industry standard.

Finally, flexible sustainment also creates added difficulties for configuration management. Effective configuration control requires constant communication between the government, Boeing, and Boeing's suppliers. In some cases, an air logistics center and an original equipment manufacturer may share configuration changes through a direct partnership. The partnership provides unobstructed channels of communication between the government and its commercial suppliers. However, in those instances where there is no existing partnership or contractual agreement, an original equipment manufacturer may not readily provide product configuration data for fear of losing business. The government must then work through its relationship with Boeing to garner manufacturer cooperation. Without effective configuration management, an organic source of repair is unable to identify potentially obsolete commodity items prior to activation and risks wasting time and dollars on outdated capabilities.

A Model for the Future

The C-17 DMAWG is a highly diverse community composed of multiple government organizations across different major commands and various Boeing representatives. It manages the C-17 depot activation effort, which is unique as a result of the incorporation of flexible sustainment.

Organic sources of repair for the C-17 face unique challenges not ordinarily confronted in a defense acquisition program. Such challenges make the C-17 depot activation process a test case for how effectively the government can initiate organic repair capabilities with a prime contractor. The Air Force should monitor and record lessons learned from its experiences with C-17 depot activation in order to ensure an effective and stable organic repair infrastructure for its premier airlifter and to establish management processes for new depot activation efforts for future weapon systems. Going organic is the way of the future for farmers and members of the defense acquisition workforce alike.

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